DATAMATION

OCTOBER 1, 1986/$3 U.S.A.
VOLUME 32 NUMBER 19
This issue, 193,001 copies

FEATURES

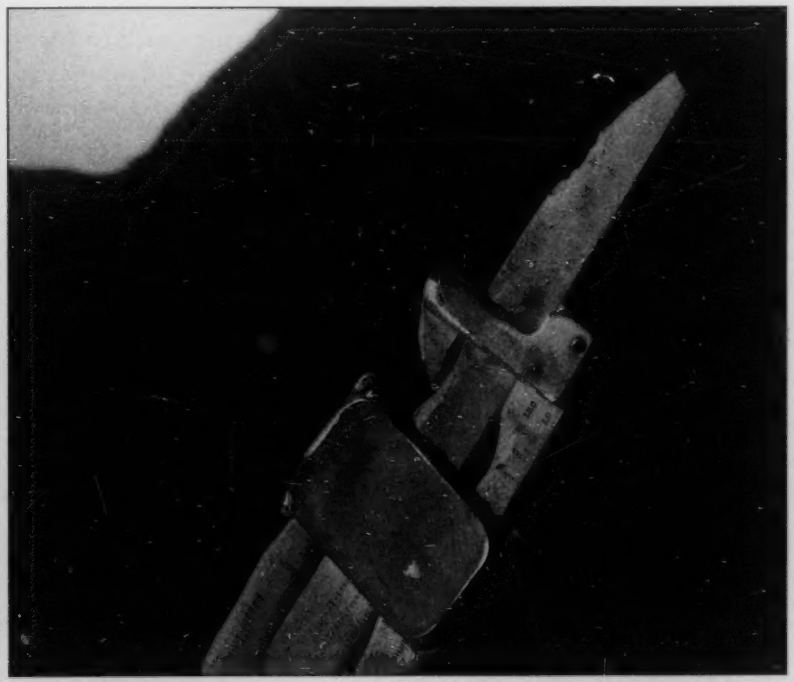
52
BEHIND THE NEWS
IBM has fostered incompatibilities to exploit and preserve its monopoly power during a period of rapid market growth and technological change. Such is economist Richard Thomas DeLamarter's view, expounded in "Square Pegs, Round Holes, Big Bucks."

70
SUPERCOMPUTING IN THE REAL WORLD
Karen Gullo
While the big machines continue to aid scientists, supercomputers will soon enter the worlds of "soft science" and MIS, where applications already require more and more computing power.

79
THE DREAM MACHINE
Edward M. Fisher
The battle to be fastest will probably continue among the conventional Cray-class supercomputers, the parallel machines, and the traditional mainframes wedded to parallelism. Whatever form the supercomputer takes, it's sure to be gobbled up by MIPS-hungry researchers.

88
FROM SLIDE RULES TO SUPERCOMPUTERS
Albert M. Erisman and Horst D. Simon
The fastest thinking machines don't yet play a major role in the curricula of science and engineering schools, but through the National Science Foundation and state initiatives, access to supercomputers has expanded enormously, and is likely to continue to grow.

99
GETTING THE DATABASE RIGHT
Robert M. Curtice
The promise of a database is its ability to share consistent and timely data throughout an organization, to enable users to access those data directly without technical assistance, and to evolve easily so that it meets changing business requirements.



NEWS IN PERSPECTIVE

22 **MAINFRAMES**
IBM's TCM causing crashes.

24 **SUPERCOMPUTERS**
Sperry enters vector market.

26 **STRATEGIES**
Convergent tries new approach.

32 **ARTIFICIAL INTELLIGENCE**
Vendors ready expert systems. Goldman talks about AI.

43 **GRAPHICS**
Business uses come of age.

48 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
19 **EDITORIAL**
109 **PEOPLE**
115 **HARDWARE**
123 **SOFTWARE**
128 **ADVERTISERS' INDEX**
128 **MARKETPLACE**

INTERNATIONAL 68-1

(DOES NOT APPEAR IN ALL EDITIONS)

- 2 **COMPUTING TO CONSENSUS**
-11 **SUPPORTING THE LOCAL CULTURE**
-17 **IN THE TURING TRADITION**
-27 **BY THE RIVERS OF BABYLON**

PHOTO OF THE GREAT GALAXY IN ANDROMEDA BY CALIFORNIA INSTITUTE OF TECHNOLOGY/SPECIAL EFFECTS PHOTOGRAPHY BY PETER ANGELO SIMON

The high-tech caravan is giving Middle Eastern countries sleepless Arabian nights.

BY THE RIVERS OF BABYLON

by Paul Tate

PHOTOGRAPH BY J. PAVLOVSKY/ SYGMA

Dressed in full military uniform and flanked by a well-armed guard of red-bereted soldiers, Iraq's First Deputy Prime Minister Taha Yassin Ramadhan marched along the red carpet running down the center of the auditorium. He was about to open the Second International Baghdad Conference on Computer Technology and Applications, which was held in the Iraqi capital earlier this year. An introductory reading of the Koran still echoed in the ears of the assembled Arab delegates as Ramadhan stepped on the stage. Above him, large portraits of the country's president, Saddam Hussein, looked out onto the audience.

A couple of hundred miles to the south, beyond the hanging gardens of the ancient city of Babylon, the armies of Iraq and Iran were locked in yet another bloody battle, the latest in the six-year war that has dominated the lives of both countries. A couple of hundred miles to the north, close to the Iranian border, Iraqi troops were fighting against local rebel forces that were taking advantage of the government's vulnerability.

Somewhere in the middle, in Baghdad's well-fortified Ministry of Planning, Taha Yassin Ramadhan welcomed the audience. "The holding of this conference in Baghdad while our brave soldiers are fighting at the front is a clear indication of the emphasis that President Saddam Hussein puts on technology," he told the gathering.

Despite the war, the crumbling economy, and an acute shortage of workers, Iraq seems determined to continue its internal development. Computer technology is playing its part. "While we defend our country against the Iranian invaders, we proceed with development in all directions, including the scientific fields," stated Ramadhan.

For most of the other Arab countries represented at the Baghdad conference, coming to grips with technology is a little easier than it is for war-stricken Iraq. Nevertheless, many of the problems they face are just as difficult to overcome. The Arab world is a stark blend of the old and the new. The oil wealth, which has transformed the region into an international force in finance and world politics over the last few decades, has left its mark. The economic, political, and social structures of the Arab countries have been affected, but only in a patchy way. Many of the old traditions, religious customs, and political rivalries remain.

The climate and geography of the region means that only a small proportion of the 15,000 square miles of the Arab world is cultivated and populated. This leads to serious transport problems and poor communications infrastructures. As a result, there are massive differences between life in the cities and in the outlying regions, with all the lack of common identity and national purpose attendant upon such a contrast.

The Arab countries with oil have fared best over the last few years. With that oil wealth came development; with development has come technology. The first computer in the Middle East was brought in by the Suez Canal Authority back in the early '50s. But it was during the '70s that the Arab countries began to invest heavily in computer systems. During that decade the Middle East was the fastest-growing market in the world for dp and communications products.

Those systems came exclusively from outside suppliers, and to a large extent they still do. IBM, NCR, Burroughs, Hewlett-Packard, Britain's ICL, France's Groupe Bull, and West Germany's Siemens still have hefty slices of the Arab market. Among the up-and-coming suppliers are Japanese firms and East Germany's Robotron. Last year, the Arab world imported an estimated $300 million of computer equipment from all these sources, much of it going to Saudi Arabia, the largest market in the region (see Fig. 1).

A PETRODOLLAR PARADISE

Just as the systems came from outside the region in the '70s, so did most of the skills to develop, program, operate, and implement them. The Arab world became a petrodollar paradise for contract computer staff from Europe and the U.S.

The legacy of that rapid rise in computer usage is common to all the Arab

IRONIES IN IRAQ

The painted banner was hanging next to the entrance of the conference hotel. The large red letters were unavoidable. "Due to the sustained efforts of the revolution, the computer is at the service of all citizens," read the banner. It was the work of one of the programmers at the Iraqi National Computer Center in Baghdad. "It was my idea," he told me. "I wrote it myself. Everyone can see it there. We are proud of what we've done."

The irony was that most of the country's citizens would never see it. The foyer of an international hotel is not a common meeting place for the majority of Iraqi citizens. What's more, most of the male population between 18 and 35 years old are involved in the war effort. Egyptian laborers and craftsmen have been imported by the thousands to continue with the many flamboyant and morale-boosting construction projects in the city, while workers from the Philippines staff most of the hotels. Most suprisingly for a Middle Eastern nation, women are employed in many areas of the economy and administration. A clear case of social change bred by necessity.

What the computer does in Iraq is help the government administer the country in the midst of a devastating war. Since President Saddam Hussein seized power in 1968, Iraq has seen a steady increase in the use and development of computer technology. The war, however, with its serious economic effects over the last few years has made purchasing computer systems an erratic pastime for Iraq. Imports of computer systems and peripherals in 1985 were around $35 million. Back in 1983, they were closer to $50 million (see Fig. 2). But with inflation running as high as 50% a year, an acute shortage of foreign currency, and a war effort to support, it is not surprising that the country's buying pattern is unsteady.

Most of the users in Iraq are in government departments, the national airline, the national bank, and the armed forces. The main suppliers come from the U.S., the U.K., France, and West Germany, although recently Robotron from East Germany has established itself in the country and the Japanese are starting to make inroads too. In fact, Iraq has become the first Arab country to sign a manufacturing license with the Japanese, building NEC pcs in local factories. The Iraqis hope to finalize a similar deal with Italy's Olivetti.

That willingness to get involved with computing at the ground level has long characterized Iraq's technology policy. The National Computer Center, set up in 1972 when there were only about 10 computers in the country, has guided the use of systems in the large organizations and brought the number of large systems in Iraq to over a hundred. More important, 90% of the applications running in Iraq have been developed locally, a testament to the in-house training NCC offers.

Microcomputers have been used since 1984, and bulk orders for Arabic language pcs were placed with a number of Western suppliers in 1985. The deals with NEC and Olivetti are a product of this pc policy, which includes setting up pc training courses in schools next year.

But there's still a long way to go. The war may have made the need for automation more acute, but it has also undermined the country's purchasing power. Desperate for foreign currency, the Iraqi dinar costs $3.22 at the country's only bank, and importing currency is severely restricted. Iraq has the motivation, some of the expertise, and the ambition to be a significant force in technological development in the Arab world. What it doesn't have is the money.

"Who would want to spend time trying to sell computers here when we aren't going to pay for them for at least two years?" asked a pragmatic taxi driver on the way to the airport. On the right was another architectural wonder, dedicated to Iraq's martyrs. The morale-boosting structure had been recently completed at a cost of 40 million dinars. It cost another 11 million dinars to have all the martyrs' names inscribed in the monument in gold. Iraq is full of such ironies.

—P.T.

countries. They all need more technical expertise, many have no local technology industry, and they are all finding that they need to modify imported products to suit the local language and culture. The need for this so-called Arabization has become even greater in the wake of on-line networks and the ubiquitous personal computer that have taken the technology closer to the Arab people.

The second Baghdad conference hoped to bring some of those blurry issues into sharper focus. It had a host of sponsors, including the Iraqi National Computer Center (NCC), the Iraqi Electronics and Computer Research Center (ECRC), the Baghdad-based Economic and Social Commission for Western Asia (ESCWA), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and the Intergovernmental Bureau of Informatics (IBI), headquartered in Rome.

The first Baghdad conference was held in 1975, when the region was beginning to catch on to computing. Over a decade later, the second conference discussed an Arab world that has caught on and wants to plan its next moves.

In the Iraqi NCC building, complete with its own armed guard in a suburb of Baghdad, 400 delegates from 25 countries, including East Germany and Japan, spent three days investigating applications, technologies, strategies, and regional issues. Applications in the oil business, medicine, education, and water control were foremost among the application areas. Microcomputers, pattern processing, and management information systems were the hot technology topics.

There was also the odd historical reference. "Iraq and the rest of the Arab world need no reminder of the importance of science and technology," said Nasim Ahmed, former federal secretary of information in Pakistan. "If it were not for the Arabic numerals, and notably the introduction of zero, we would not be discussing computer technology today."

That was a long time ago. Today the Arab world is lagging behind the main industrialized countries in its development and use of technology. That is reflected in the three main recommendations from the conference.

- The Arab world needs to increase its use of microcomputers, particularly in education.
- Regular conferences and workshops should be set up to help disseminate expertise in developing and applying technology.
- Local independence should be achieved through the "Arabization of computer language."

Emphasizing Arabic language in automation is seen as an essential forerunner of widespread computer use in the region. There are already a number of bilingual software packages available, but too few by far, according to local users. A lot of work is going into Arabic linguistics, but the research is fragmented and the results are sometimes contradictory.

A WHOLE DIFFERENT APPROACH

It is not just that the Arabic characters are different from the standard Western letters and symbols; the whole approach to the written language is different. At the University of Kuwait, researcher Fatma AlKhalifa has been working with Nabil Ali of Al-Alamiah Software on a study of the differences between English and Arabic in computing. "In a way, Arabic and English represent the two extremes of computational diversity," says AlKhalifa.

Linguistically, they are strangers. In computing terms the differences affect the keyboard layout, the display controls, error detection and correction, database organization and text retrieval, to name but a few areas. There are also problems with data security, since encryption is heavily based on text compression, and new algorithms are needed for Arabic text. For the local

computer user, that all makes life uncomfortably difficult. For the Arabic language software developer, it makes it challenging.

"The Arabic language is spoken by over 150 million people," explains A. Mouradi from the Moroccan Faculty of Sciences, "but it has not been studied in depth in terms of the user interface. Little work has also been done about Arabic speech, both in synthesis and recognition." Mouradi has started to do something about that. In a project at the Moroccan Faculty, he has developed some linguistic rules covering the conversion of Arab text to speech. One practical early result is an Arabic equivalent of Texas Instruments' Touch and Tell game.

On a more serious level, Arabic programming languages are starting to emerge. The Arabic Computer Language (ACL) being developed by M. Sharif and H. Nasser in Iraq and the DHAD language of M. El-Khayat from the Saudi Arabian Petrol and Minerals University in Dahran are both subsets of Pascal. The first is an educational and training language while the second is aimed at defining data models.

Some progress has already been made in having Arabic acknowledged as an international standard in computing. The Arab Organization for Standardization and Metrology (ASMO) in Amman, Jordan, submitted a draft standard to the International Standards Organization for an Arabic code table in 1985 and after amendments it was accepted. ASMO 449-1985, as the original proposal was called, should help to regulate the way Arabic is used in processing and information interchange.

"The standardization of Arabic information processing is not a simple task, and technology advances quicker than we think," says Ahmad Abu-El-Haija from the Yarmouk University in Jordan. "It's hoped that Arab experts, manufacturers, research institutes, universities, and interested organizations will collaborate on other important issues in this field. That is what makes a standard."

The conference recommended a number of steps that may help achieve such a level of cooperation. Special courses should be organized that will bring together computer experts and Arabic language experts to work on the Arabization of computer language. Research centers in Arab countries and Arab researchers in foreign universities should direct their work to using the language in programming and to developing devices suited to Arabic. Language labs in the Arab countries should be asked to set up computer projects. Computer suppliers should be asked to increase their research into Arabic systems if they want to increase sales. And finally, national and regional projects must be coordinated.

FIG. 1
DP IMPORTS TO SAUDI ARABIA
($ THOUSANDS)

	FIRST HALF 1985	FIRST HALF 1984
France	7,474	1,674
W. Germany	4,392	4,377
Italy	140	732
Japan	4,225	1,668
U.K.	9,614	8,817
U.S.	33,041	41,390
Scandinavia	759	3,437
Others	2,978	13,234
Total	62,623	75,329

Source: Middle East Computing

FIG. 2
DP IMPORTS TO IRAQ
($ THOUSANDS)

	1984	1983
France	2,735	19,185
W. Germany	865	4,282
Italy	3,583	48
Japan	4,615	14,914
U.K.	1,953	2,660
U.S.	2,891	1,228
Scandinavia	49	84
Others	475	682
Total	17,166	43,083

Source: Middle East Computing

NEED TO COMBINE EFFORTS

That call for Arabic collaboration ran through many discussions. "Activities in Arabization are scattered around the Arab world," explained Yousif Nassir, the director of computers systems at the Royal Scientific Society in Jordan. "We need to combine our efforts to achieve results."

That was also the consensus of the Arab Regional Meeting on Informatics held by the IBI at the same time as the Baghdad conference. The representatives from eight major Arab countries decided that it was about time the League of Arab States had a department responsible for informatics and its local coordination. So far the league has not responded.

The Arab League is the largest coordinating body in the region. Set up in 1944 by the so-called Alexandria Declaration, it now comprises over 20 Arab nations and aims to foster close relations between its members.

On the computer side it has set up a number of departments covering natural sciences, documentation and information, communication, and Arabization. But many members of the computer fraternity don't regard its activities very highly.

"The trouble with the whole region is the politics," confided one Kuwait representative, educated in computer science in California and now back home working at the Kuwait Ministry of Planning. "That's why it's so much trouble to get countries to work together."

The often unstable political climate in the Middle East "overshadows the work of the Arab League's technical organizations and enormously complicates and hampers any cooperative work within the Arab world," asserts Michael Agi, a Syrian researcher currently working at the West German research institute GMD.

Agi's recent book, *Dataprocessing and Telecommunications in the Arab World* (published independently by G. Agi, Koenigswinter, West Germany, 1986), paints a detailed picture of computer and communications development in the region, and he devotes a chapter to the need for greater Arabization. As technology progresses, "the widespread use of English-based systems will be prohibited by language problems, since more and more employees with insufficient knowledge of foreign languages will be involved in using technology," predicts Agi.

That is not only undesirable for anyone trying to increase computer usage in the region, it is also undesirable from a cultural point of view. "Are we going to let our cultures be dominated by other cultures or are we going to participate?" demanded Jordan's Nasser.

So much for rhetoric. What about a time frame for achieving the aims set out by the Baghdad conference? "We are confident that something will happen now," concluded Nazar Al-Najran, a young technical support manager from Kuwait, one of the new breed of computer-wise government officials that attended the conference. "The countries involved recognize how important these technologies are and that they must work together to get the best out of them for the Arab world."

Perhaps the Arabization moves that are now under way will help that new breed achieve its technological goals. It may also help to overcome the prohibiting effects of some Arabic traditions. Pakistan's Ahmed sums the feeling up nicely: "We hear a good deal about fundamentalists today. To my way of thinking, many of these fundamentalists have their backs to the future. To face our future, we have to grasp the fundamentals of the present age."